PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Present Application:

Applicants : ROUNDHILL, David N. et al.
Attorney Docket No.: 500789.01
Filed : Concurrently herewith
Title : ULTRASOUND HARMONIC IMAGING SYSTEM AND METHOD

Prior Application:

Examiner : F. Jaworski
Art Unit : 3737
Serial No. : 08/943,546

REQUEST BY APPLICANT FOR INTERFERENCE WITH A PATENT

Box Patent Application
Assistant Commissioner of Patents.
Washington, D.C. 20231

Sir:

Applicant hereby requests an interference with a patent. Pursuant to 37 C.F.R. § 1.607, the patent is identified as U. S. Patent No. 5,928,151, and the proposed counts are as follows:

Count 1. A method for producing a three dimensional reconstruction with an ultrasound system, the method comprising the steps of:

(a) transmitting ultrasonic energy at a first frequency band into a subject during said imaging session, said subject being free of added ultrasound contrast agent throughout the entire imaging session;

(b) receiving ultrasonic echo information associated with said transmitted ultrasonic energy;

(c) filtering from said echo information a plurality of information signals associated with a second frequency band, said second frequency band comprising at least a harmonic band of said first frequency band; and

(d) forming the three-dimensional reconstruction in response to said information signals.

Count 2. An ultrasound apparatus adapted for generating a three dimensional reconstruction of a subject during an imaging session, said subject being free of added ultrasound contrast agent throughout the entire imaging session, said apparatus comprising:

a transducer;

a transmit beamformer operatively connected to said transducer for transmitting ultrasonic energy into a subject during said imaging session, said subject being free of added ultrasound contrast agent throughout the entire imaging session;

a receive beamformer operatively connected to said transducer and configured to obtain echo information;

a filter operatively connected to said receive beamformer and operative to filter from said echo information a plurality of information signals associated with a harmonic frequency band, said harmonic frequency band comprising harmonics of a fundamental frequency band transmitted into the subject; and

wherein the three-dimensional reconstruction is responsive to said information signals.

Count 3. A method for producing a three dimensional reconstruction with an ultrasound system, the method comprising the steps of:

(a) transmitting ultrasonic energy at a first frequency band into a subject during said imaging session, said subject being free of added ultrasound contrast agent throughout the entire imaging session;

(b) receiving ultrasonic echo information associated with said transmitted ultrasonic energy;

(c) obtaining from said echo information a plurality of detected Doppler information signals associated with a second frequency band, said second frequency band comprising at least a harmonic band of said first frequency band;

(d) forming the three-dimensional reconstruction in response to said information signals; and

(e) displaying a Doppler image selected from the group of: velocity, variance, energy and combinations thereof, the Doppler image being responsive to said three dimensional reconstruction.

Count 4. A method for producing a three dimensional reconstruction with an ultrasound system, the method comprising the steps of:

(a) transmitting ultrasonic energy at a first frequency band into a subject during said imaging session, said subject being free of added ultrasound contrast agent throughout the entire imaging session, said ultrasonic energy characterized by a peak power level near said first frequency band;

(b) receiving ultrasonic echo information associated with said transmitted ultrasonic energy;

(c) obtaining from said echo information a plurality of information signals associated with a second frequency band, said second frequency band comprising at least a harmonic band of said first frequency band, and a second plurality of information signals associated with said first frequency band;

(d) forming the three-dimensional reconstruction in response to said information signals; and

(e) displaying a composite image responsive to said three dimensional reconstruction and representing three dimensions, said composite image comprising spatially distinct near-field and far-field regions, said far-field region emphasizing information signals in the first frequency band and said near-field region emphasizing information signals in the second frequency band.

Count 5. A method for producing a three dimensional reconstruction with an ultrasound system, the method comprising the steps of:

(a) transmitting ultrasonic energy at a first frequency band into a subject during said imaging session, said subject being free of added ultrasound contrast agent throughout the entire imaging session;

(b) receiving ultrasonic echo information associated with said transmitted ultrasonic energy;

(c) obtaining from said echo information a first plurality of information signals associated with said first frequency band and a second plurality of information signals

associated with a second frequency band, said second frequency band comprising at least a harmonic band of said first frequency band;

(d) compounding the first and second plurality of information signals; and

(e) forming the three-dimensional reconstruction as a function of said compounded information signals.

The claims of the patent corresponding to the proposed counts are as follows:

COUNT	PATENT CLAIM	APPLICATION CLAIM
Count 1	1	102
Count 2	73	103
Count 3	90	104
Count 4	91	105
Count 5	96	106

The terms of application claims 102-106 may be applied to the disclosure of the application as follows:

Count 1

Transmitting ultrasonic energy at a first frequency band into a subject and receiving ultrasonic echo information associated with the transmitted ultrasonic energy is described throughout the specification, including on page 6, lines 3-5. Generating harmonic ultrasound images without the use of a contrast agent, which is known as tissue imaging, is described on page 1, line 33 through page 2, line 7 and on page 6, line 33 through page 7, line 12, among other places. The filtering of information signals associated with a second frequency band, *i.e.*, the harmonic band, is described in the portions of the specification relating to the digital filter 118 of Figure 1 and in the portion of the specification relating to Figures 14 and Figure 10. Forming a three-dimensional reconstruction from the information signals is described on page 9, line 22 through page 10, line 3 and reflected in Figure 1 by the inclusion of 3D Image Rendering Unit 162, a 3D Image Memory 164 and a Video Processor 140 that processes the 3D video data.

Count 2

An ultrasound apparatus adapted for generating a three dimensional reconstruction of a subject during an imaging session is referenced on page 9, line 22 through page 10, line 3 and reflected in Figure 1 by the inclusion of 3D Image Rendering Unit 162, a

3D Image Memory 164 and a Video Processor 140 that processes the 3D video data. Ultrasound imaging without the use of contrast agents, known as tissue imaging, is described on page 1, line 33 through page 2, and line 7 and on page 6, line 33 through page 7, line 12, among other places. A transducer 110 is shown in Figure 1, and a transmit frequency control unit 117, A/D 115 and beamformer 116 of Figure 1, which are described on page 4, line 33 through page 7, line 15, correspond to the transmit and receive beamformer for transmitting ultrasonic energy into a subject during an imaging session. A filter operatively connected to the receive beamformer is shown in Figure 1 as the digital filter 118, which is connected to the output of the beamformer 116. As explained on page 9, lines 13 through21 and elsewhere in the specification, the digital filter 118 is operative to filter from the echo information a plurality of information signals associated with a harmonic frequency band. These harmonics are harmonics of the fundamental frequency band transmitted into the subject, as explained on page 1, line 25 through page 2, line 7. As explained on page 9, line 22 through page 10, line 3, the three-dimensional reconstruction of the subject represented by the image is responsive to the information signals.

Count 3

Page 9, line 22 through page 10, line 3 indicates that the ultrasound imaging system can produce a three dimensional reconstruction. The steps of transmitting ultrasonic energy at a first frequency band into a subject during an imaging session is described on page 5, lines 1-7 and elsewhere throughout the specification. The step of imaging using tissue harmonics in which no contrast agents are present is described, *inter alia*, at page 1, line 33 through page 2, and line 7 and page 6, line 33 through page 7, line 12. The step of receiving ultrasonic echo information associated with the transmitted ultrasonic energy is described on page 6, lines 3-9 and elsewhere throughout the specification. Obtaining from the echo information that is output by the digital filter 118 a plurality of detected Doppler information signals associated with a second frequency band is described on page 9, lines 22-25 with respect to the Doppler processor 130 (Figure 1). Page 9, lines 3-17 indicates that the second frequency band is a harmonic band of the first frequency band. Page 9, line 22 through page 10, line 3 indicates that a three-dimensional reconstruction is formed in response to the information signals. Finally, the step of displaying a Doppler image responsive to the three dimensional reconstruction selected from the group of: velocity, variance, energy and combinations thereof, is described 9, lines 22-33, which indicates that the Doppler Processor 130 produces velocity and power Doppler signals.

Count 4

A method for producing a three dimensional reconstruction with an ultrasound system is described on page 9, line 22 through page 10, line 3. The step of transmitting ultrasonic energy at a first frequency band into a subject during an imaging session is described on page 5, lines 1-7 and elsewhere throughout the specification. The step of imaging using tissue harmonics in which no contrast agents are present is described, *inter alia*, at page 1, line 33 through page 2, and line 7 and on page 6, line 33 through page 7, line 12. The step of receiving ultrasonic echo information associated with the transmitted ultrasonic energy is described on page 6, lines 3-9 and elsewhere throughout the specification. Transmitting ultrasonic energy characterized by a peak power level near a first frequency band is described on page 5, line 8 through page 6, line 2 and elsewhere in the specification, and is shown in Figures 4 and 5. The step of receiving ultrasonic echo information associated with the transmitted ultrasonic energy is described on page 6, lines 3-9 and elsewhere throughout the specification. Obtaining from the echo information that is output by the digital filter 118 a plurality of detected Doppler information signals associated with a second frequency band is described on page 9, lines 22-25 with respect to the Doppler processor 130 (Figure 1). Page 9, lines 3-17 indicates that second frequency band is a harmonic band of the first frequency band. Obtaining information signals associated with the first frequency band, *i.e.*, the fundamental frequency band, in addition to information signals associated with the second (harmonic) frequency band, is shown in Figure 14 in conjuction with Figure 10, which are described on page 15, line 21 through page 26, line 12. Page 9, line 22 through page 10, line 3 describes the step of forming a three-dimensional reconstruction in response to the information signals. Finally, the step of displaying a composite image responsive to the three dimensional reconstruction comprising a spatially distinct near-field region emphasizing information signals in the second (harmonic) frequency band and a far-field region emphasizing information signals in the first (fundamental) frequency band is described with respect to the embodiment of Figure 14 on page 25, line 24 through page 26, line 12.

Count 5

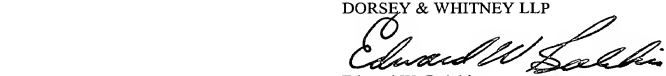
A method for producing a three dimensional reconstruction with an ultrasound system is described on page 9, line 22 through page 10, line 3. The step of transmitting ultrasonic energy at a first frequency band into a subject during an imaging session is described on page 5, lines 1-7 and elsewhere throughout the specification. The step of

imaging using tissue harmonics in which no contrast agents are present is described, *inter alia*, at page 1, line 33 through page 2, and line 7 and page 6, line 33 through page 7, line 12. The step of receiving ultrasonic echo information associated with the transmitted ultrasonic energy is described on page 6, lines 3-9 and elsewhere throughout the specification. The step of obtaining from the echo information a first plurality of information signals associated with the first (fundamental) frequency band and a second plurality of information signals associated with a second (harmonic) frequency band is described in the specification with respect to Figures 10 and 14, such as on page 23, line 29 though page 24, line 16. Compounding, *i.e.*, combining or blending, the first and second plurality of information signals is also described in the specification with respect to Figures 10 and 14, and various compounding techniques are described on page 24, line 21 through page 26, line 12. Finally, the step of forming the three-dimensional reconstruction as a function of the compounded information signals is described in the specification on page 9, line 22 through page 10, line 3 and on page 23, line 29 through page 26, line 17.

Under 35 U.S.C § 135(b), a claim that is substantially the same as a claim in an existing patent must be presented within one year from the issue date of the patent. U. S. Patent No. 5,928,151 issued on July 27, 1999. Since this divisional application and preliminary amendment containing claims 102-106 are being filed on or before July 27, 2000, the requirements of 35 U.S.C § 135(b) are met.

Respectfully submitted,

DORSEY & WHITNEY LLP



Edward W. Bulchis
Registration No. 26,847

EWB:cff

Enclosures:
Postcard

1420 Fifth Avenue, Suite 3400
Seattle, WA 98101
(206) 903-8800
(206) 903-8820 (facsimile)
o:\ip\documents\clients\atl\500789.01 interference.doc